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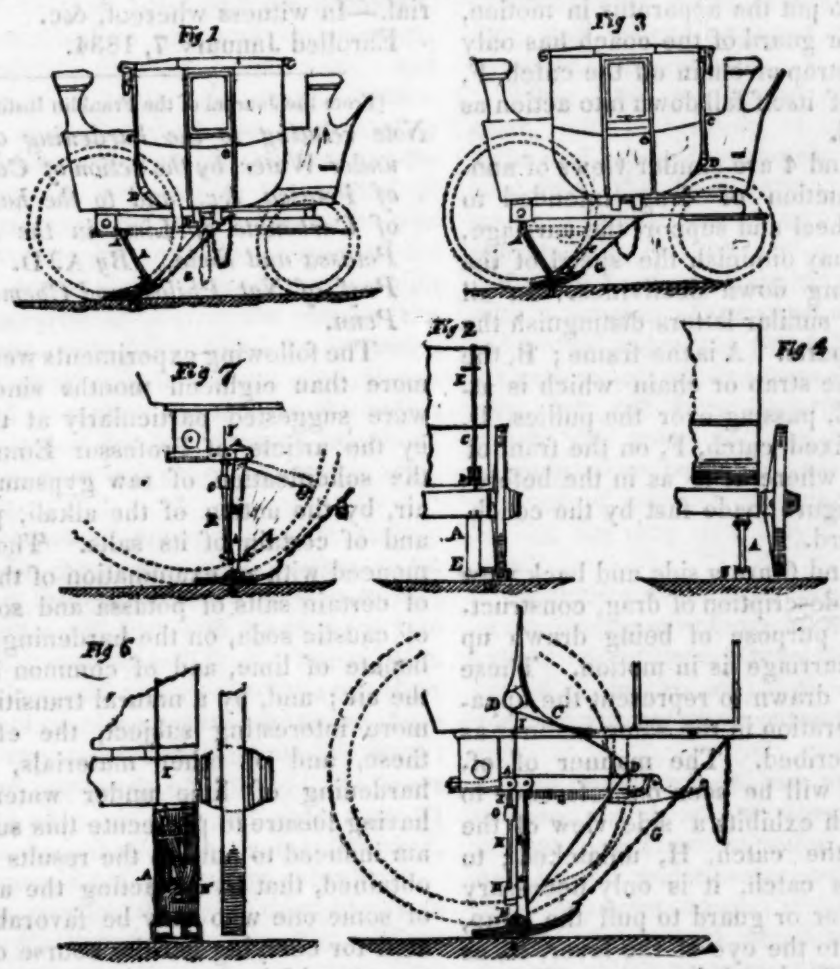
REES' IMPROVED CARRIAGE-DRAG.



[From the Repertory of Patent Inventions.]

Specification of the Patent granted to DAVID REES, *of Brecon, South Wales, Woollen Manufacturer, for Improvements on Drags or Apparatus to be applied to Carriages.*—Sealed August 7, 1833.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said David Rees, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon, (that is to say):

Figs. 1 and 2 represent a side view, and so much of a carriage as is necessary to exhibit the application of my improved apparatus which consists of a drag. In the side view the drag is attached, in a working position, as having shod the wheel which does not require to

have the progress of the vehicle impeded, to render it beneficially useful. A is the frame attached to the axletree of the carriage; B, the shoe; C, the strap, or chain, which is attached to the frame at E, passing over the friction pullies, D, D, to the fixed catch, F, at the back of the carriage, where it is made fast by the coachman or guard; G is the drag-chain. The apparatus when out of use will assume the position under the carriage as shown by the drag and appendages in red color.* To put the apparatus in motion, the driver or guard of the coach has only to slip the strap or chain off the catch, F, and it will of itself fall down into action as represented.

Figs. 3 and 4 are similar views of another construction of drag, intended to raise the wheel and support the carriage, so that it may diminish the speed of the vehicle going down declivities. In all the figures, similar letters distinguish the respective parts. A is the frame; B, the skid; C, the strap or chain which is attached at E, passing over the pullies, D, D, to the fixed catch, F, on the front of the coach, where it is as in the before-described figure made fast by the coachman or guard.

Figs. 5 and 6 are a side and back view of another description of drag, constructed for the purpose of being drawn up whilst the carriage is in motion. These figures are drawn to represent the apparatus in operation in the same manner as before described. The manner of effecting this will be seen on reference to fig. 7, which exhibits a side view of the drag with the catch, H, unlatched; to unlatch this catch, it is only necessary for the driver or guard to pull the strap, I, attached to the eye of the lever, K, as seen in fig. 6, when it becomes sufficiently removed to allow the catch to liberate itself from the latch, L, which is kept down in position by the spring, M. The guard or staple plate, O, is intended to retain the lever in its proper situation. Upon removing the catch by the means described, the wheel of the carriage again comes in contact with the ground to support the vehicle, and the drag may be taken up to the position shown in red color* under the body of the carriage.

* Shown by dotted lines in the engraving.

Now, whereas it is evident by the foregoing description, that my improvements on drags or apparatus to be applied to carriages are applicable to every description of wheeled carriages, only varying the length and substance according to the diameter of the wheels, and weight of the carriage; and I therefore claim as my invention the application of the whole of the above combination as herein represented and described, without limiting myself to the use of any particular material.—In witness whereof, &c.

Enrolled January 7, 1834.

[From the Journal of the Franklin Institute.]

Note relating to the hardening of Lime under Water, by the action of Carbonate of Potassa, &c., and to the hardening of Carbonate of Lime in the Air, by Potassa and Soda. By A. D. Bache, *Prof. of Nat. Philos. and Chem., Univ. Penn.*

The following experiments were made more than eighteen months since, and were suggested particularly at the time by the article of Professor Emmett, on the solidification of raw gypsum in the air, by the action of the alkali, potassa, and of certain of its salts. They commenced with an examination of the effect of certain salts of potassa and soda, and of caustic soda, on the hardening of carbonate of lime, and of common lime, in the air; and, by a natural transition, to a more interesting subject, the effect of these, and of other materials, on the hardening of lime under water. Not having leisure to prosecute this subject, I am induced to publish the results already obtained, that by attracting the attention of some one who may be favorably situated for carrying out the course of experiment which they suggest, it may be carried forward to completion. The conclusions cannot fail to be of interest, both in a practical and theoretical point of view.

It is well known that certain impure limestones yield, when calcined, a lime which hardens under water, technically called hydraulic lime. Experimenters, who have examined these limestones, with a view to determine the ingredient giving this hydraulic property, have not agreed in their conclusions; the essential ingredient has been in turn supposed to

be silica, alumina, oxide of iron, and oxide of manganese. My friend, Col. Totten, informs me that Col. Troussat, in a recent work on mortars, attributes this power of conferring hydraulic properties upon lime, in certain cases, to soda—an ingredient which, before his examination, had not, I believe, been detected in any hydraulic limestones.

The method of ascertaining the effect of the substances experimented upon, in causing lime to harden under water, was similar to that employed by Raucourt, and described in his work on mortars. The mixture having been made, and brought to a paste of a proper consistency, was placed at the bottom of a glass vessel, and water poured gently upon it. A wire stem, terminated at one extremity by a wooden disk, was placed vertically upon the mixture in the vessel, and the weight ascertained which was required to pierce the mass; the hole thus made being filled up, by tamping the mixture with a blunt stick, it was allowed to remain exposed to the action of the water for any desired length of time, and then subjected again to a similar trial.

As almost all common lime is slightly hydraulic, an examination of that to be used in the experiment was first made; having been slaked, and, when made into a thick paste, placed at the bottom of a wine-glass, and water added, the test stem was applied, the mixture having set, bore 1 oz. troy upon the head of the stem; after an exposure of one day, the mass bore 1½ oz.; and after two days, bore 3¼ oz.; it had then been so far disturbed, that it would not resume its cohesion.

This *common lime* was thus shown to *possess feeble hydraulic properties.* When mixed with sand and water, so as to form a tolerably rich mortar, the mass, after it had set, bore 5¼ oz. on the rod, and, after two days, 7 ounces, which was the maximum weight borne. In *its mixture with sand*, this lime formed a *mortar which was feebly hydraulic.*

Some of this lime was mixed with caustic hydrate of soda, which, however, had a portion of adhering carbonate. The proportion of soda added was not particularly attended to; it was, however, much less in weight than the lime. The mass became so soft, that when, after tamping in the bottom of the glass, water was added, the test rod penetrated it freely. After one day, the mixture bore 4 oz. troy, upon the wooden disk at the top of the rod; after another day, 5½ oz., which was the maximum. It recovered this strength twice, by the interval of a day between the times at which it was disturbed by the penetration of the rod. *Soda*, it then appears, renders lime, to a certain extent, capable of setting under water.

Lime being made into a paste, with soda and water, acquired considerable consistency in the air.

When lime was made into a thick paste, with a solution of carbonate of soda, and exposed to the air, it crumbled into dust; this being mixed again with water, assumed consistency at first, but subsequently crumbled.

Lime did not set in the air, when mixed with a solution of sulphate of soda; the incoherent mass was pulverized, and reset with water, which increased the cohesion, but not very materially. Under water, the paste of lime and sulphate of soda, four parts of lime by weight, and one of sulphate of soda, bore 9 oz.; but on the very next day lost its cohesion.

Carbonate of potassa, mixed with lime, in the proportion of six, by weight, of the salt, to two of lime, formed a mass which crumbled in the air; but, being re-set with water, assumed considerable cohesion.

This same mixture had hydraulic properties; for 4 oz. of lime, 2 of carb. potassa, and 11 oz. of water, being mixed and placed under water, bore, after two days' exposure, 64 oz., or 5⅓ lbs., which was all the weight which was at hand. A mass of the same mixture, which had been exposed to the air, and was but slightly coherent, being placed under water, became quite hard.

An attempt was made, by reducing the proportion of carbonate of potassa to about 12 per cent., to harden the lime in the air; but it did not succeed.

A curious effect was produced by *soda*, and by *potassa*, on *carbonate of lime*, reduced to powder, and, after mixture with alkali and water into a paste, exposed to the air. The carbonate became, in one case, harder than the original material,

and in another, but little inferior to it in hardness; in the former case, the experiment was made upon chalk; in the latter, upon Carrara marble. The marble had very nearly the appearance of the original material, and a cast taken from it would have had a beautiful appearance, very different from the dull white of plaster of Paris. Neither of these mixtures was hydraulic; and when a mass of chalk and soda, which had hardened in the air, was placed in water, it was completely disintegrated.

I had, at the time of making these experiments, a quantity of silica, which had been prepared by passing fluo-silicic acid into water, and which, never having been heated, was still soluble, though, of course, in a small degree; after repeated washings, it still restored the red color of alkanet, which had been rendered purple by a feeble alkaline action. This silica was mixed with lime and water, so as to form a paste, and being placed under water, would not bear the weight of the test rod; it was exposed for four days, and was softer, at the end of the trial, than at the beginning.

[From the London Mechanics' Magazine.]

Improved Portable Fire-Ladder.

Sir: I have several times had occasion to notice the improved fire-ladders employed by the London Fire Establishment, and as I may frequently have to refer to them again, I take this opportunity of forwarding a description of them for instruction in your Magazine, the more particularly as they cannot be too well known.

Fig. 1 is a representation of one of the single ladders, on a scale of half an inch to a foot; the top of the ladder is so made, as to slip into the lower part of another, and the iron straps *a a*, and *b b*, embrace the ends, making a safe and substantial joint. As every ladder in the service is made precisely alike, it matters not in what order they are taken, as all will fit one another.

Every engine carries two lengths of these ladders, so that on all occasions the firemen can command a ladder of any required height, by joining a sufficient number of lengths together, and they have frequently found them of infinite service. When used, the first ladder is held as high as the men can conveniently reach, and a second ladder is pushed up to it, the top pieces going into the straps *b b*, while the lower ends of the first ladder enter those marked *a a*, making a secure joint; the second ladder is then raised, and others added until the required elevation is obtained. Three ladders, which will reach about 18 feet, are easily handled; but when four or more lengths are to be joined, the raising of them becomes more difficult in proportion to the height; every little projection in the wall, against which they are raised, catches the ladders, and impedes their ascent.

Fig. 1.

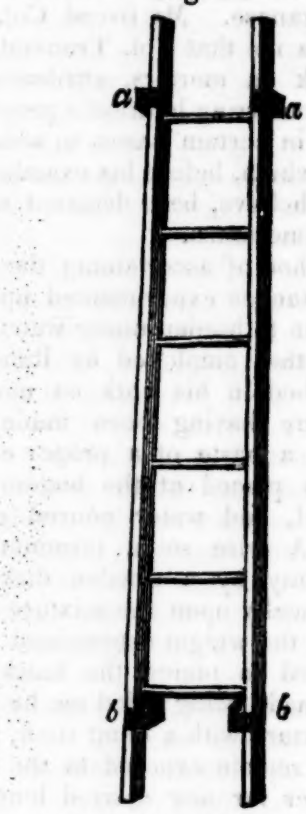


Fig. 2.

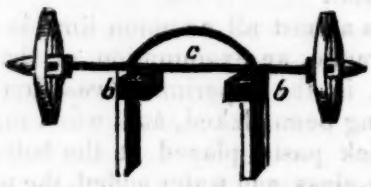


Fig. 2 is a sketch of a simple piece of apparatus, which I have contrived, for obviating the above difficulties; it consists of two short side-pieces, corresponding to the bottom part of a ladder, with

the joints *b b*. On the upper part is an iron axle, carrying a pair of small light wheels; a semi-circular connecting-rod of iron preserves the proper position of the side-pieces, when not mounted on the ladder. For convenience of stowage, the wheels take off, when the whole lays flat in a small compass. Each end of the axle *c* is provided with rising springs, similar to those in an umbrella-stick, which allow the wheels to be slipped on the axle, but effectually prevent their sliding off again until the springs are depressed. These springs answer the purpose of linch-pins, without the trouble attending their use, and thus enable the apparatus to be fitted up for use in a few seconds. When mounted with this carriage, any number of lengths may be joined, and the compound ladder run up with the greatest facility, as the wheels would traverse all the inequalities of surface, cornices, window-sills, &c., without subjecting the men to any unpleasant jerks and strains.

Some few provincial fire-offices have adopted this kind of ladder, and I have no doubt that when their advantages are sufficiently known, and duly appreciated, their use will become very general.

I remain, Sir, yours respectfully,

WM. BADDELEY.

London, Dec. 10, 1834.

A Compendium of Civil Architecture, arranged in Questions and Answers, with Notes, embracing History, the Classics, and the Early Arts, &c. By ROBERT BRINDLEY, Architect, Surveyor, &c.

[Continued from page 30.]

SPECIFICATIONS.

After the design of a building is approved, *Working Drawings* for the mason, bricklayer, carpenter, joiner, &c. (upon a quarter-inch scale,) must be made; and from these all specifications emanate, as to the qualities and thickness of walls, chimney breasts, shafts, in heights, depths, &c, scantlings of joists, girders, principals, ties, &c. In drawing out a specification, strength, economy, appearance, and domestic comfort, are to be duly regarded.

First, begin with the EXCAVATIONS, —that they are of proper depth and firmness, agreeably to the nature of the soil,—introducing arches, either upright or inverted, or piles, as necessary. Then consider the line of excavation for drains, or cess-pools, keeping them as distinct from the premises as possible; but in no wise to effect the foundations of the building; all this depends upon locality.

The foundation walls are then to be described, either under the head of BRICKLAYER, or STONEMASON, and the walling, (including main-building, wings, and offices,) carried up, according to determined dimensions, with every opening specified: quoins, arches, strings, facings, are all to be denominated, and every thing that pertains to such work.

If the building is to be tiled, let this come under the head of the bricklayer; as also chimney-shafts, brick and tile flooring; but all stone work, as fronts, steps, landings, quoins, plinths, strings, sills, cornices, copings, pavings, staircases, sinks, hearths, mantle-pieces, &c. pertain to the stone-mason.

CARPENTER'S work forms an important feature in building; as unity of strength with that of the stone or brick-work is peculiarly identified. All joists should be of good scantling, particularly girders, for, properly arranged, they become great ties to the structure. Partitions framed, especially those supplying a centre wall, should be very strong, and well put together; inasmuch as they receive and support the centre portion of the roof, which should be constructed as light as possible, yet combining strength, not arising in ponderous mass. Every portion must be distinctly enumerated with the several scantlings; nor must be forgotten cradling, centering, &c. as may be necessary, according to the construction of the building.

Next, consider the SLATER, describing the qualities of the slates, and the method of laying them, (whether on battens or boarding,) and the finishing of the roof-covering by ridge and hip tiles, or lead.

Take the PLASTERER: first, the *internal part* of the building, bearing in mind the appropriation of each room, the plan on which it is laid out, and the method by which it is enclosed, whether by walling and nogging, or framed or skeleton partitions. Describe the ceilings—

plain, coved, circular, elliptical, or waggon-headed; the different mouldings or cast cornices to be run round, or flowers to be worked in, and the finishing of the same. Let the walls and partitions be described; as floated render set, lath and plaster set, trowel-stuccoed, prepared for painting, or rough cast and rusticated, in imitation of stone.

The JOINER'S work, which is the most multitudinous, requires very mature consideration, as much elegance combined with comfort may accrue from proper arrangement; and here every room in the building must be distinctly mentioned. Begin with the flooring in the basement: enumerate the joinery of the kitchens, as skirtings, dressers, shelves, closets, mantle-pieces, windows, shutters, doors, and dressings, also passage doors, and skirtings, kitchen stairs, described by treads, risers, carriages, strings, and spandrills. Next, the ground-flooring, taking the dining and breakfast room, fully delineating skirtings or plinths, doors, architraves, frames, and sashes, boxings, shutters, and architraves, backs, and elbows, dwarf closets, angle-shafts, &c. Next, the one-pair flooring, or the drawing and bed-room, in the same manner; as also chambers, attics, and garrets, in rotation. Staircases and landings must be particularly described, with risers, treads, carriage, strings, balustres, rails, &c. water-closets, with their fittings. Domestic offices out-doors, columns, &c. are all to be severally named, as also front doors, with porticoes, back-front doors, outside shutters, &c.

PLUMBER'S work, as leading of cisterns, roofs, hips, ridges, gutters, flushings, pipes, water-closets, and pumps, occupy a minute portion in the specification.

The GLAZIER must have the description of glass, whether, plate, Newcastle, or common, for sashes of every room.

The PAINTER will require the description of his work, whether in common oils, flatted, or varnished; in plain or fancy colors, according to the situation and appropriation of every room.

IRONMONGERY is always included with the joinery, excepting extra bars, iron paling, columns, &c.; which must be fully inserted.

Note—This description of specification is applicable to a palace, a mansion, a church, chapel, theatre, prisons, barracks, and every species of building—regulating the same with the construction of the edifice.

CONTRACTS

Are simple epitomes of specifications, enumerating every species of work in the proposed building, and requiring

TENDERS

To be made from the several builders, containing a price affixed to every portion of work so named. But this is seldom adopted in form, (excepting in Government works, or for a building in a round sum,) as all artificers' works, after their completion, are taken and measured at fair measure and value prices, by surveyors appointed from each party. In carrying on the several works, the surveyor superintending the same indemnifies the proprietor by reserving, from time to time, as payments are made, a per centage for the due performance and execution of such work. In Government works, the contractor or contractors are obliged to produce bondsmen, in various amounts, for the fulfilment of these contracts, Government reserving, at the time of the several payments, a per centage as a further security.

ESTIMATES

Are formed upon the basis of the specifications and the working plans. For, from the latter, every portion of the several artificers' works can be accurarely measured: and these dimensions reduced square, and cubed, as though passing through a building. It remains, then, to draw out the quantities of each work, price them, and find the total; taking also into consideration the localities and contingencies; for which an allowance must be made.

All buildings and premises may be valued faithfully upon this principle, noting their appropriation, extent of ground, and tenure, whether on lives, lease of years, or fee-simple, as also dilapidations, &c.*

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* *Duties on Valuations and Appraisements.*—41 Geo. III., Chap. 43. By clause V. it is enacted, "That no person shall exercise the calling or occupation of an Appraiser, or act as such within the intent and meaning of this act, without taking out a License, &c. and every such license shall state the true name and place of abode of the person taking out the same,

The following averaged costs of the several artificers' works, including materials, labor, &c. in building, in London, according to the rates of houses, will afford criteria to estimate:

Rate.	Dimensions	Number of Stories.	Bricklayer.	Carpenter.	Slater.	Mason.	Joiner.	Ironmongr.	Plasterer.	Plumber.	Glazier.	Painter.	Total.
	Ft. Ft.		£	£	£	£	£	£	£	£	£	£	£
7	18 by 25	2	70	35	15	10	150	20	60	10	20	10	400
6	21 " 27	2	80	60	30	15	220	25	80	15	30	20	570
5	24 " 30	3	100	80	40	20	290	35	100	20	40	25	760
4	27 " 33	3	140	100	45	30	320	40	120	25	50	30	900
3	29 " 36	4	200	130	60	60	400	60	130	35	75	50	1200
2	22 " 39	5	260	150	70	90	480	80	170	60	90	60	1500
1	35 " 41	5	340	150	90	100	560	90	200	70	100	70	1800

To which must be allowed expenses for excavations, &c. according to the locality; also add the purchase of ground.

It must be observed, that the interior fittings of a house, as also the external fittings, with compo, cement, &c. according to the taste of the owner, will greatly decrease or enhance the value of the building.

Detached houses, as villas, mansions, &c. amount to more, on account of the additional quantity of brickwork in flank walls, the preceding being taken in terraces and crescents.

For labor only, in building, a deduction may be made of thirty-five per cent., on these terms, generally.

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which is to be taken out *yearly*, on penalty of £50 by whoever shall appraise, value, &c.

The duties by 48 Geo. III. Chap. 149, p. 1487, are —Appraisements or valuation of any estates or effects, real or personal, heritable or moveable; or of any interest therein; or of the annual value thereof; or of any repairs wanted; or of the materials and labor used, or to be used, in any buildings; or of any artificers' work whatsoever.

Where the amount of such appraisement or valuation shall not exceed 50*l*., 2*s*. 6d.; exceeding 50*l*. and not exceeding 100*l*., 5*s*.; exceeding 100*l*. and not exceeding 200*l*., 10*s*.; exceeding 200*l*. and not exceeding 500*l*., 15*s*.; exceeding 500*l*., 20*s*.

Exemptions.—Any appraisement or valuation made in pursuance of the order of any court of admiralty.

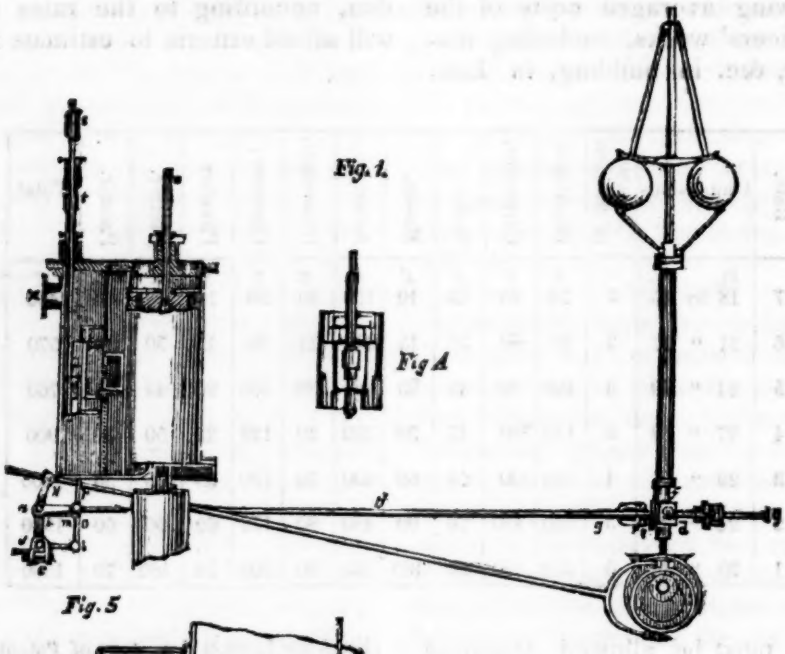
Licence (page 1515) to use and exercise the calling or occupation of an appraiser, 6*s*.; to be taken out *yearly*, by every person who shall exercise the said calling or occupation, or make any appraisement or valuation, herein-before charged with a duty, for, or in expectation of, any gain, fee, or reward, *except licensed auctioneers*.

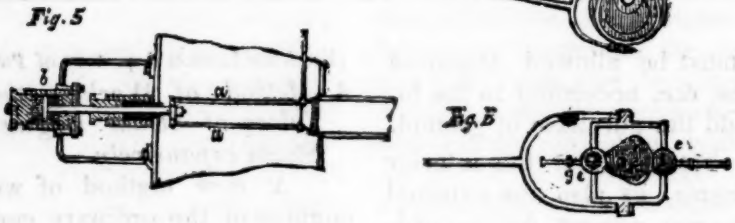
[From the London Repertory of Patent Inventions.]

A Method of Working the Slides and Valves of Steam Engines when using Steam expansively.

A new method of working steam engines of the ordinary construction expansively, in which the time of cutting off the steam is regulated by the governor, is shown in fig. 1, which is a side view, in which some of the parts are seen in section, and in fig. 2, which is an end elevation of the cylinder, and nozles and the gearing for working the valves. In both figures the same letters are placed beside the same parts.

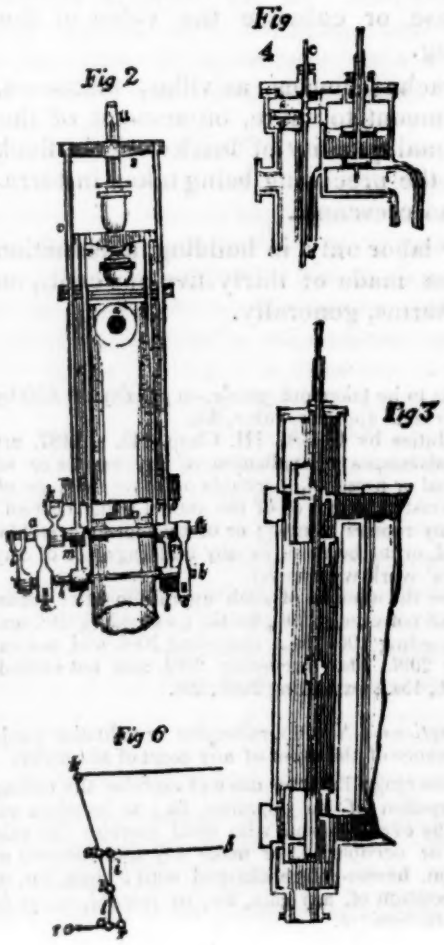
The brackets into which the gudgeons, *a*, *a*, of the rocking shaft work, are bolted to the cistern; these brackets, the weights that balance the valves, and some other things are not drawn, in order that the new parts may be seen distinctly. *b*, *b*, the shaft which works the cut-off valves, moves in two levers, *c*, *c*, which are keyed on the rocking shaft. The governor makes the same number of revolutions as the crank shaft, and the wiper *d*, and the other parts connected with it, work the cut-off valves in the following way. Part of the governor rod is turned cylindrical, and there is one or more threads of a screw (which makes one revolution in about twenty times its diameter), raised upon it at this place; and the piece *f*, is bored, and it has a thread or threads cut into the hole, so that it may work easily upon the turned part of the governor rod, with the screw





raised upon it. The outside of *f* is fitted into a hole bored through the wiper, in the very same way as the governor rod is fitted into the hole in *f*, only the screw should be raised in the eye of the wiper, to allow the collars that are fixed above and below it, to prevent it from rising or falling, to be as small in diameter as possible; as this will diminish the friction on the ends of the wiper, it will be more easily acted on by the governor. *e*, *e*, are friction rollers, and the parts *g*, *g*, of the frame that holds them, slide backwards and forwards in brass guides. The rod, *h*, communicates the motions of the frame to the lever, *i*, (shown by dotted lines in the elevation,) which gives motion to the shaft, *b*, *b*, on which the levers, *l*, *l*, are fixed; and these levers move the rod which works the cut-off valves, by means of the cross head, *s*, and the side rods, *o*, *o*. The rods, *n*, *n*, must have ball and socket joints, to allow their bottom ends to turn round, as they work the part, *f*, up and down.

The screw that connects the inside of *f* to the governor rod, should wind in a different way from the screw that connects the outside of *f* to the wiper. Both screws are drawn on the same side in the



elevation, but they should be on opposite sides, as in fig. B, which is a ground section of some of the parts now described.

As the screw cut into the outside of *f* has its lateral direction as it winds downwards, the same as the motion of the wiper, the friction on the under collar will assist the governor to turn the wiper backwards, and the weight of the wiper will diminish the friction on the upper collar, when it (the wiper) is turned in the opposite direction. The collars, and the brackets to which they are fixed, are not drawn, as they would have the part *f*.

k is the lever into which the rod from the eccentric works. By following out the remaining letters in both figures, the positions, &c. of the other parts will be known. The levers, *m*, *m*, are loose on the rocking shaft: their use is to keep away a motion of the cut-off valves that would take place if their side rods were connected immediately to the levers, *l*, *l*.

By inspecting the section of the valve in fig. 1, and the back view of it in fig. A, it will be seen that the construction is that of the short slide valve, with an additional piece or box without back or front cast on each end, of the same length and breadth as the steam-ways, and it will also be seen, that these additional parts could make no difference whatever in the working of the engine, unless the face of the nozles on which the valve slides, prevented steam from entering in at the front of the additional box that is next the steam end of the cylinder when one of the small cut-off valves (shown also in the same figures) covered the back part of this box. The rod which works the cut-off valves passes through the centre of the valve rod, which has a stuffing box at the top. In fig. A the two small rods are shown, which connect the two cut-off valves.

The manner in which the governor acts on the wiper so as to regulate the motion of the engine, will be understood from what follows. The wiper, *d*, must be so placed when the engine is working with the governor balls down, that it will work the cut-off valves, so that one of them will cover the additional box through which the steam is passed into the cylinder, exactly at the termination of the stroke of the piston; in this position of the balls, the engine is working slow, and it has the full pressure of steam during the whole length of the stroke, to bring up its motion. If the screws on the down end of the governor rod, and in the wiper, wind in proper directions when the balls move outwards, the wiper will be turned forward from its aforementioned position, and it will cut off the steam nearer to the commencement of the stroke. This will keep the engine working at about the same velocity, whether the load upon it is great or small, unless it is overburdened. When the wiper has made about half a revolution from its position on the governor rod when the balls are down, the balls are as far up as they can get, and the steam will be cut off at the very commencement of the stroke, so there is no danger of the engines running away.

There is no pressure of steam, and in consequence of this there is very little friction on the cut-off valves when they are working: because, the box on the end of the slide valve that the cut-off valve is upon, is always so far past the termination of the face on the nozles, that the steam is admitted to both sides of the cut-off valve that is moving off the box. This will be better understood by inspecting figures 1 and 3, where it will be seen that the terminations of the face on the nozles are exactly in a line with the inside of the extreme ends of the additional boxes, when both steam-ways are covered by the slide valve; and as the faces on the back of the slide valve on which the cut-off valves work are raised above the back of the valve, there can be no pressure of steam on the valve that is open, to hinder its motion.

The movements of the rocking shaft cannot alter the position on the slide valve that the cut-off valves are put into by the wiper, *d*, on account of the end of the lever, *i*, into which the rod, *h*, from the wiper works, never being very far distant from the centre of motion of the rocking shaft. It would not do to let the shaft, *b*, *b*, work in fixed brackets, because the slide valve is always in motion and the cut-off valves would have no corresponding motion to keep them at their places on the slide valve.

As the extremities of the wiper are composed of circles drawn from the centre of the governor rod, the wiper will

be very easily moved by the governor, when the circled parts are passing the friction rollers, for the friction of the wiper on the rollers at that time will be nothing, because the rollers are set just so far apart as not to touch the extreme parts of the wiper.

The stroke of the cut-off valves is very short, and the ruffs on the parts, *g*, *g*, regulate its length. When the shaft that works the cut-off valves is placed (as in figs. 1 and 2) under the rocking shaft, the rod *h* rests upon the top end of the lever, *i*, and its weight keeps the friction rollers from bearing upon the extreme or circular parts of the wiper, by bringing the frame to bear upon two of the ruffs of the parts, *g*, *g*.

As the screw feathers, that form the connection between the governor rod and the wiper, make only one revolution in about twenty times the diameter of the parts screwed, no power applied to the end of the wiper can turn it without taking the governor rod along with it, but the least power from the governor will cause the wiper to revolve on the rod.

If the wiper is made long enough, and its top end connected to the rods, *n*, *n*, there is no use for the intermediate part, *f*. In this case the friction rollers must have no flanches, and the wiper will rise or fall twice the distance that the part, *f*, rises or falls.

In fig. 3 a similar kind of cut-off valve is applied to the common, D, valve, as in figs. 1 and 2. The end of the top eduction pipe is shown by the darkened circle, and the flanched branch at the top of the nozles is under the eduction pipe. The steam pipe is on the side of the nozles that is cut away, but its form and position are given by the dotted lines. Only a part of the cylinder is drawn.

Round slide or piston valves may have a smaller piston working inside of each valve to cut off the steam.

In what is termed the leech slide valve, the cut-off valves instead of sliding may work on hinges like a common foot or discharge valve. The cut-off valves in this case will be up or down when they are open, and their position when shut will be nearly a horizontal one.

The diagram (fig. 6) gives a very simple arrangement of the rods and levers for working the slide and cut-off valves in a horizontal engine. In this figure the same letters are placed beside the same parts as in figs. 1 and 2.

By applying the apparatus described in the above plans to a steam engine without a governor, its power may be altered without stopping it, by having a rod and handle connected to the part *f*. When no governor is required, it will be simpler to have the wiper, *d*, upon the crank shaft.

A cut-off valve, placed betwixt the top steam valve, and another one placed betwixt the bottom steam valve and the boiler, if they were wrought by a wiper, as shown in figs. 1 and B, would work well if the pressure of the steam was not upon the valves when they are opening. Valves constructed like the one shown in fig. 4, are well adapted for this and other purposes: the rod that works the valve is seen at *c*; *a*, *a*, are the rods that support the principal part of the pressure, and the rod, *d*, goes down the steam pipe to work the cut-off valve at the bottom. Fig. 5 is a plan of the valve on a large scale: in order to adjust it to its seat, cork, or some other substance that will spring a little, is put into the box *b*. The pressure may be on any side of a valve of this sort; if the pressure is on the same side of the valve with the rods, *a*, *a*, the joints of these rods may be left the least thing loose: in this case the method of adjusting the valve by means of cork is not necessary. The snug on the top of the valve seat, for the end of the valve to rest on, is only wanted in particular cases.

For slide valves, the plans given in figs. 1, 2, and 3, are best adapted, and for conical valves, the plans shown in figs. 4 and 5 may be adopted.

In the plans that are described in this letter for cutting off the steam at any portion of the stroke of the steam engine, the number of motions of the parts are one half less; the action required from the governor to turn the wiper is not so great (as the wiper never moves parallel to the axis of the friction rollers), and it is more uniform; and the steam is cut off nearer to the cylinder than in Messrs. Maudsley and Field's plan. Mr. Tredgold's method of working, by jerks, heavy slide-valves, that are

either firmly packed, or else have a great pressure of steam upon them, is certainly not a good one, even if the time of cutting off the steam could be regulated by the governor. To persons who understand perfectly the old and the new methods, other advantages in the new over old plans, besides those now enumerated, will present themselves.

Shifting a wiper round to any position on its shaft, by means of a screw-feather, may be used to advantage in many mechanical arrangements besides the above.

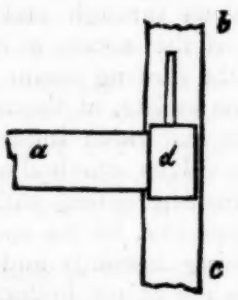
I should have mentioned before, that the smaller of the two circles, which nearly circumscribe the wiper, *d*, must be a semi-circle ; and I should also have noticed, that cutting off the steam at one end of the cylinder, opens the cut-off valve at the other end always soon enough to give the engine steam at the beginning of the next half of its stroke.

By giving this letter a place in your valuable journal, you will very much oblige yours, respectfully,

JAMES WHITELAW.

Glasgow, Nov. 12, 1834.

P. S.—A very simple, though perhaps not the best plan of working steam engines expansively, is shown in the annexed sketch, in which *a* is the pipe



leading from the boiler, and the ends, *b*, and *c*, of the pipe *b*, *c*, go, the one to the top, and the other to the bottom steam valve. If a plunger, *d*, which fits the pipe, *b*, *c*, exactly, be wrought up and down past the pipe, *a*, by means of a common eccentric, it (the plunger *d*) will cut off the steam at any portion of the stroke, by shifting the eccentric round on its shaft. By lengthening the faces of the cut-off valves, or by making a slip joint on the rod that works them, an eccentric may be used in any of the above plans, if it is shifted by hand, to its right position on its shaft.

By a trifling modification of the gearing for working the valves, the plans given in this letter may be applied to almost every form of the steam engine.

We are indebted to the politeness of Dr. Bartlett, editor of the Albion, for the following drawing and description of a Rotary, or "*Gravitating* Rotary Engine." It is singular in its construction, although not new to us in the application of the steam through the main shaft and arms. The hollow rim and "gravitating" part of the machine are to us entirely new.

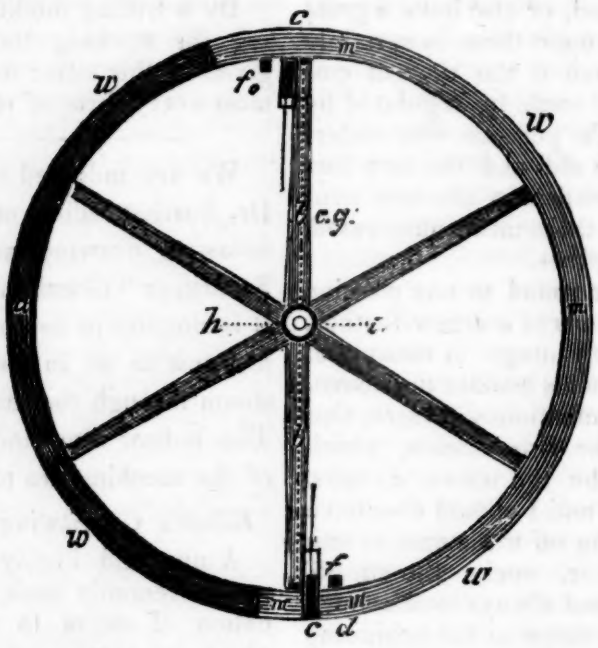
Elliott's Gravitating Rotatory Engine.

A new and highly important discovery has recently been made in the application of steam to a very simple machine, by combining those two powerful agents, *steam* and *gravity*, together, and called a *Gravitating Rotatory Steam Engine*, for generating a steady rotatory motion by the pressure of steam exerted between a gravitating weight and a *closed and alternating* valve,* and capable of communicating a direct rotatory motion, as a *first mover* to all kinds of machinery, *by means of a single wheel on a shaft*, requiring neither crank or piston, or but very few of the incumbrances of the common steam engines now in use.

The above is the invention of an Englishman, Mr. James Elliott, a native of Rothbury, Northumberland, Eng., a practical mechanic, who has been employed in the construction of a great variety of mills, and other machinery, in the Province of New-Brunswick, and has occupied the most of his leisure time for the last eleven years in its completion.† We have procured a drawing of this gravitating rotatory steam engine, and from the following brief description, with which we have been furnished, we presume that any scientific person may form a pretty

* Resembling in operation a dog in a turn-spit ; but as the weight will not move like the dog, the steam is introduced between the weight and valve, to represent the dog's motion ; or resembling a sailor setting *an-end* a bale or barrel : he places his back against something solid, and setting his feet against the bale, pushes it into its place. In this operation, the steam introduced as before represents the man's motion.

† The model of the first attempt having been destroyed in the great fire at Miramichi, in the year 1825.



correct idea of its plan, simplicity, and capabilities. As to its application as a *first mover*, we may safely assert that it is unequalled.

The principal part of this gravitating rotatory steam engine consists of a strong cast iron wheel, of any given diameter, having a hollow rim, with three, four, or more arms in it, some of which are also hollow, for conveying steam. A part of the space in the hollow rim of this wheel is very nicely fitted inside with a piece of solid cast iron, or other heavy metal, forming the *gravitating weight* intended to fix the maximum of the desired power, which weight slides *freely* all round this rim, *or more properly the rim round it*, and is made steam tight at or near its ends, either with packing in the common way, or with mercury. The steam is made to enter the wheel at its centre, by a moving steam-tight collar, fitted on the wheel shaft close to the wheel, and passes by a valve into one of the hollow or *working* arms, which conducts the steam to the rim while that arm is at the lower circumference,* when the valve at the extremity of the arm shuts, and brings the pressure of the steam in contact with the gravitating weight in the hollow rim, where, acting with its expansive force against the end of the weight, and pressing against the closed valve, a separation of these parts takes place, the rotatory motion is generated, and the wheel is moved round by this joint resistance (the weight remaining suspended at the pressure) until that arm is carried round to the top, when the valve attached to it opens and lets the weight slide quite clear of it; *whilst the valve in the opposite arm* being at the bottom in *its* turn, now shuts through and cuts off a small body of the steam at its pressure, and resists the flowing steam as the first one had done before, at the same instant opening the exit valve immediately behind it; the valves attached to the working arms thus alternating with great mechanical regularity, let the speed be ever so great, being instantly and simultaneously *shut* when at the bottom, and *open* when at the top of the circumference.

A rotatory engine of 100 horse power, of this descriptive principle, would not weigh more than $1\frac{3}{4}$ or 2 tons—need not be over 10 feet diameter—or the hollow rim not more than from 10 to 18 inches wide; for although the longest leverage is at all times the most desirable, yet the difficulty of construction is somewhat increased by so doing. For steamboats, this rotatory engine is put immediately on to the paddle-shaft which crosses the boat, occupying the centre of the boat; or two smaller wheels may be used, placing them near to the sides of the vessel,

* Each working arm is fitted with sliding valves worked by hand gearing, for starting the machinery, or reversing the motion.

and on each side of the boiler, which boiler may be in the middle.

As stated before, the motion produced is one continued, steady rotation; there is no waste of steam in the operation, and not an atom of steam goes into the wheel but what *must* exert its whole force —is subject to no unequal pressure, no retardation or jerking (inseparable from the use of cranks)—no minor parts of machinery to get out of order—no friction except the shaft in its boxes, the steam collar, and the sliding of the gravitating weight through the rim; its advantages also in *time saved* are as much superior to engines on the *old principle*, as a *wheel* lathe is to a *pole* one. The cost of construction will not exceed one fourth the price of an engine on the old principle, nor occupy more than one fifth of the usual space—can be worked on either the high or low pressure principle; when for the latter, he adds a small wheel of the same description, on the same shaft, and not over 4 feet diameter, or 3 inches square in the rim, for an air pump; and makes double steam pipes in the working arms of the large rotatory wheel.

It must be highly gratifying to the lovers of science in general, that this highly important discovery of a new application of steam has been made, and to learn that this engine, which has occupied the attention of scientific gentlemen and practical mechanics, both in Europe and America, from the early days of the highly gifted Watt to the present time, should at length have been discovered amidst the forests of New-Brunswick, by an unassuming mechanic, among other pursuits occupying his winter evenings' amusement.

Labor omnia vincit.

References—*w*, *w*, *w*, *w*, exhibits a full view of the engine wheel, exposed with one of the sides off, on a scale of a quarter of an inch to a foot; *a*, the gravitating weight, occupying so much of the hollow rim; *b*, *b*, the working arms; *c*, *c*, the valves attached to the arms; *c*, *d*, the lower valve, shut for resistance; *f*, the exit valve open, blowing off the waste steam, supposing the wheel to have already performed half a revolution; *b*, *c*, *g*, the upper arm with the valve open to pass the weight, and the exit valve, *f o*, closed—the dotted lines on the two working arms show the passage for the steam; *h*, the steam-tight collar on the shaft; *i*, the shaft—the motion, as the plan now lays, will be against the sun; *m*, *m*, *m*, *m*, the space occupied with steam when in motion. The wheel, as here represented, shows the position of the gravitating weight when working at a high pressure. When the steam gets at a lower pressure, the weight will gravitate and balance lower, and the valves open at a different part of the circumference; and as the opening and shutting of the valves depends on the position of the weight, and are governed by it, they never can come in contact with it, except as exactly wanted. The hand gearing is not represented on the plan, because there are several methods of fitting it; and on so small a scale it would be impossible to give a clear representation of any of them.

To the Editor of the Mechanics' Magazine:

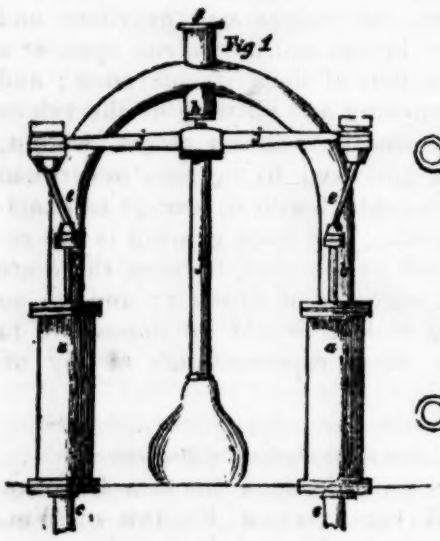
Have you, sir, seen the new Locomotive Rotary Steam Engine of Wm. Avery, on the Newark Railroad, in operation? If you have not, I hope you will take an early opportunity of examining it, as I consider it one of the most ingenious yet simple machines I ever saw, and its operation is highly satisfactory to those who have seen its performance. Yours, very respectfully,

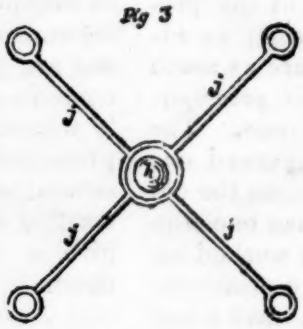
A Mechanic.

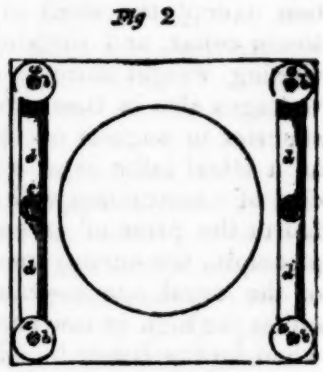
In reply to the above question, we can say that we have not yet witnessed the operation of this engine on the railroad, although we saw one of them, many months since, in operation, in the machine shop of Elam Lynds, Esq. and William Avery, at Syracuse, Onondaga county, N. Y., which performed to admiration, carrying at the same time all the machinery of an extensive machine shop, blowing the bellows of a cupola furnace, and performing other work, with only an 18 inch arm, or 3 foot engine, and making the almost incredible number of over 3000 revolutions, as we were informed, in a minute. Several engines of the same description are, as we have been also informed, now in operation, and in all

cases, so far as we know, to the entire satisfaction of those who use them.

We have been promised an early description and drawing of the engine for the Magazine, which, when received, will be given to our readers without delay, when we hope the ingenious and enterprising inventor, and gentleman with whom he is associated, Mr. Lynds, will derive ample remuneration.—[Ed. M. M.]







***Specification of the Patent granted to* John Barton, *of Goswell Road, in the County of Middlesex, Engineer, for Improvements in the Construction and Application of Pumps and Machinery for raising Fluids and other Purposes.*—Sealed June 1, 1833.**

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said John Barton, do hereby declare the nature of my invention, and the manner in which the same is to be performed and carried into effect, are fully described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon, (that is to say):

My invention consists in certain arrangements of apparatus and machinery, whereby I am enabled to take advantage of any vibration which may be produced to the body or apparatus or vessel, in which my improvements are placed, and thereby produce to the pump or pumps a constant working action; thus, for instance, in a ship or vessel, the motion caused whilst sailing or lying at anchor will at all times be producing more or less action to the pumps on board, when constructed and applied according to my improvements. And my invention consists in so suspending or connecting a weight or weights to the piston-rods of pumps, that in whatever direction an inclination may take place, such weight or weights, from their being able to act in any direction, will cause a working motion to the pumps, and it is the giving a universal power to such weights to turn to their work, in whatever direction the inclination or oscillation may take place, which constitute my present improvements. But in order that my invention may be most fully understood, I will describe the drawings hereunto annexed, which represent an arrangement or combination having four pumps, by which it will be evident that other numbers of pumps may be worked in like manner by my improvements. But I conceive that it will not be necessary for me to describe more than these arrangements, as any competent workman will from these be able to apply my improvements to other numbers of pumps. And I would observe, that my invention does not relate to the ordinary parts of pumps, the constructions of which are well known.

Fig. 1 represents an elevation; fig. 2, a plan; and fig. 3 is also a plan of the cross-arms and handles by which the four pumps are worked. By these three figures my invention is represented as applied and arranged for working four pumps; *a*, *a*, being four ordinary pump-barrels or cylinders; *b*, *b*, their piston rods; *c*, *c*, their induction or suction pipes; and *d*, *d*, their eduction-pipes, which discharge themselves into the pipes, *e*, *e*, from whence the water may be conveyed to any direction from the point, *f*, by connecting proper pipes thereto; *g* is a rod suspended from above at *h*, where the rod, *g*, has a spherical ball at its end, which works within a spherical socket formed at *h*, and thus producing a universal joint, as is well understood by mechanics, by which the rod is capable of oscillating in any direction. On to this rod, *g*, is affixed the cross-arms, *j*, which arms are at right angles to each other, and work the four piston-rods, as will be evident on inspecting the three figures of the drawings, the piston-rods being connected by connecting rods, working by universal joints, in like manner to that before described. Now it will be evident, that if a weight be suspended to the rod, *g*, sufficiently heavy to work the four pistons, and the quantity of this weight will vary even for the same sized pump-barrels, depending on the perpendicular height of the lift, it will not be necessary to give any particular dimensions; all that it will be desirable to observe is, that whatever be the pressure of the water to be lifted, the weight in falling from side to side shall be sufficient to overcome the resistance.

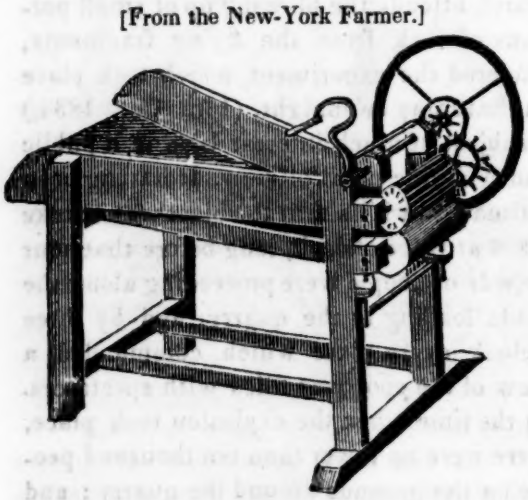
Having now described the nature of my invention, and the manner of combining and using the same, I would have it understood that I am aware that a weighted pendulum has been already used for actuating pumps, but has only been capable of swinging or vibrating in one direction, consequently was of no use in situations where the vibration, or oscillation, is continually changing its direction; I do not, therefore, lay any claim to a weighted pendulum working in such manner, but I claim the giving a universal property to turn, in any required direction, to a weighted pendulum actuating pumps, whereby, in whatever direction the vibration or inclination may take place, the said weighted pendulum, or other similar apparatus, may be able to turn in that direction, and work the pump or pumps; for I would observe, that although I have only described an arrangement of four pumps, it will be evident that similar effects may be produced to one or more pumps.—In witness whereof, &c.

Enrolled November 30, 1833.

Great Blast at Craigleith Quarry.—The long time in which preparations for a great explosion at this quarry have been going on, and the effects that were expected to result from the experiment, by a great saving of labor and expense, in at once dislodging a great mass of rock, and also lessening, if not altogether removing, the risk which attends the blowing up of small portions of rock from the flying fragments, rendered the experiment which took place on Saturday se'ennight, (18th Oct. 1834,) a subject of much interest both in a public and scientific point of view. It having been intimated by bills that the blast was to take place at three o'clock, long before that hour crowds of people were proceeding along the roads leading to the quarry, and by three o'clock every place which commanded a view of the spot was filled with spectators. At the time when the explosion took place, there were no fewer than ten thousand people on the grounds around the quarry; and curiosity was so much excited, that even on the Castle-hill, and also on the Corstorphine hill, a great many people were collected. At half-past two o'clock, the conductor, enclosed in a block-tin tube, 26 feet long, and half-inch diameter, was introduced into the bore. The depth of the bore was 60 feet, and 7½ inches diameter at top, and 6 at the bottom, and was charged with 500 lb. of Sir Henry Bridge's double-strong blasting powder. At half-past three the match was lighted, and in three minutes the explosion took place. The report was not so loud as from a small piece of ordnance; but the effect that was produced was highly satisfactory to all the scientific gentlemen present, and completely fulfilled the expectations that had been conceived by the projector.

At the moment of explosion, the great mass of rock appeared to those at a short distance to be forced upwards, and then to rend in large and deep fissures. It is calculated that upwards of 20,000 tons of solid rock have been displaced by this experiment. The plan seems to be perfectly safe and practicable, and, we understand, was conducted and carried through by Mr. Millar, who, in 1824, after the great fire in the Parliament Close, suggested and carried into effect the blowing up of the gable of the high land which overlooked the Cow-gate. Among the scientific gentlemen who were present, we observed Mr. Jardine, Mr. Playfair, Professor Wallace, Professor Forbes, Mr. Stevenson, Mr. Buchanan, and Mr. Grainger. —[Edinburgh Observer.]

[From the New-York Farmer.]



GREEN'S STRAW CUTTER.—This is the most simple and efficient machine of the kind that has yet been offered to the public. It is made very strong, and not liable to become injured, nor to get out of order. The apparatus consists principally of two cylinders; the upper one is of iron, having the requisite number of knives secured in grooves. The under cylinder is of lead, and can be raised or lowered, so as to have the knives merely to come in contact with it. It will be perceived that the knives perform the double operation of cutting and feeding. All that is necessary in operating is to put in the straw, and turn the crank. After the straw is once cut, it can be put in again, and cut, with increased rapidity, the second time. More than double the quantity can be cut in the same time by this than by any other machine, used in this section of the country.

This straw cutter may be had of the agents, H. Huxley & Co., 81 Barclay street, New-York.

I set a man at the crank, and with the hay close to the machine commenced feeding. With my utmost exertion, I could not keep it regularly supplied. In *five minutes* we cut *eleven bushels*, heaping measure, of hay. Had it been fed according to its power of execution, one-fourth more would have been cut. Had I used straw instead of hay, the quantity cut in the above time would have been as great, as it is more easy to supply the machine without interruption. It cuts corn stalks with rapidity, particularly small ones. The box is made large, and by putting a good deal of hay in at once, or by having it close to the machine, one person can feed it and turn the crank at the same time. S. F

POWER OF MACHINERY IN GREAT BRITAIN.—Mr. W. Pares, at a public meeting, lately held at Birmingham, stated in proof of the increase of the powers of production, by the improvement of machinery, that in 1792, the machinery in existence was equal to the labor of ten millions of laborers; in 1827, to 200 millions; and in 1833, to 400 millions. In the cotton trade, spindles that used to revolve 50 times in a minute, now revolve in some cases 800 times in a minute. In one mill at Manchester, there are 136,000 spindles at work, spinning one million two hundred thousand miles of cotton thread per week. Mr. Owen, of New-Lanark, with 2,500 people, daily produces as much cotton yarn as will go round the earth twice and a half. The total machinery in the kingdom is calculated now to be equal to the work of 400 millions, and might be increased to an incalculable extent under proper arrangements.—[Birmingham Journal.]

BIRDS.—The bones of birds are hollow, and filled with air instead of marrow.

In the arrival of migrating birds, the males arrive several days before the females.

Wild ducks are estimated to fly 90 miles an hour; swallows fly rather faster, and the swift is said to fly above 200 miles an hour.

Sparrows generally have 3 broods in a year.

Of singing birds, the nightingale unites the highest perfection of qualities, the linnet next; then the tit-lark, the sky-lark, and ths wood-lark: the goldfinch and the robin excel in lively notes.

In July, most singing birds become silent. Those which sing through the winter are chiefly young birds.